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Ophthalmia Neonatorum in England 1884–1944*

Arnold Sorsby, M.D.

PRESENTS Incidence, Notification, and Control of Ophthalmia Neonatorum in England.

IN 1884 a collective survey conducted by the then recently established Ophthalmological Society of the United Kingdom showed that between 30 to 41 per cent of inmates of schools and institutions for the blind had been blinded by ophthalmia neonatorum. As this survey included adults as well as children, it is clear that considerably more than 30 per cent of all blind children at that time had lost their sight through ophthalmia neonatorum. In 1922 the Ministry of Education in a survey at schools for the blind found that 28.5 per cent of the children at such schools were blind from this affection. A parallel investigation carried out in 1944 showed a marked decline; ophthalmia neonatorum was now responsible for not more than 9.2 per cent. Between 1884 and 1922 there had therefore been some decline, possibly a considerable decline, in the incidence of blindness from ophthalmia neonatorum, but the decline registered between 1922 and 1944 is of considerable magnitude. It is likely that in the course of the present decade blindness from ophthalmia neonatorum will have become rare. One may assume this from the fact that in the four years 1941–44 only three infants are known to have been blinded from ophthalmia neonatorum throughout the whole of England and Wales.

Factors in the Decline of Blindness from Ophthalmia Neonatorum

Three distinct developments are responsible for this gratifying decline. In the first place there must have been a considerable

* Based on *Ophthalmia Neonatorum—the Problem after Thirty Years of Statutory Notification and Sixty Years of Credé Prophylaxis*, Sorsby, London: Institute of Ophthalmology, 1945.

decline in the incidence of ophthalmia neonatorum from the widespread application of the Credé technique, which was developed in the eighties of the last century. How beneficial that practice was is brought out by Sidney Stephenson in his monograph published in 1907. In spite of the wide acceptance of Credé's teaching, ophthalmia neonatorum still continued to exact a drastic toll, and this led to a movement in which many ophthalmic surgeons and progressive local authorities were concerned. It was their aim to provide adequate facilities for treatment, and their pioneer work culminated in a statutory order promulgated in 1914, which made ophthalmia neonatorum a notifiable disease, and imposed upon the local authorities the obligation of either satisfying themselves that adequate treatment was available to the affected infant, or of providing such treatment.

Though there is no adequate statistical evidence, there is much to indicate that it was this statutory enactment which initiated the downward trend in the incidence of blindness from ophthalmia neonatorum. The decline was so steady that in the four years 1934–37 the number of babies reported as blind from ophthalmia neonatorum was 6, 7, 8, and 7 for each year, respectively, for the whole of England and Wales. These figures are reliable, as the outcome of treatment under the order must be recorded. Blindness from ophthalmia neonatorum had therefore ceased to be a mass problem, and had become reduced to occasional tragedies. That ophthalmia neonatorum was, however, still a formidable affection is seen from the fact that in 1938 the number of blinded babies had increased to ten, while the number of babies whose vision had been impaired by the infection for each of the five years 1934–38 was 30, 36, 36, 31 and 24, respectively.

The almost total elimination of blindness and impaired vision from ophthalmia neonatorum obtaining today must be ascribed to the influence that began to exert itself by about 1940. The sulphonamides replaced the classical methods of treatment and reduced the duration of ophthalmia neonatorum from weeks to as many days, greatly eliminating the danger of corneal involvement. The movement begun in the eighties of the last century, which aimed at prophylaxis; the activities of the early years of this century, which aimed at adequate facilities for treatment; and the

recent developments in chemotherapy, to which penicillin therapy must now be added—together have achieved a result as striking as any in the annals of public health.

Compulsory Notification

The reduction in the incidence of ophthalmia neonatorum following the use of the Credé method of prophylaxis is now a matter of history. In England and Wales the focal point in the decline of blindness from ophthalmia neonatorum is undoubtedly the Statutory Order of 1914. Prior to 1914 some of the more progressive local authorities had made ophthalmia neonatorum notifiable and had provided facilities for treatment, and it was the very success of these experiments in notification that led to the general Order. That Order, rightly, made no distinction in the different etiological types, or in the degree of severity of the affection. Ophthalmia neonatorum for the purpose of this order was defined as a "purulent discharge from the eyes of an infant commencing within twenty-one days from the date of its birth." It imposed on both midwives and medical attendants the duty to notify the authorities of the affection.

The Order was modified in 1936, when the duty of notification was laid exclusively on the medical attendant; the duty of a midwife was now to summon medical assistance in a case of "any inflammation or discharge from the eyes, however slight." This modification, while it imposes no extra obligation on the medical attendant, has ensured that no mild case under the care of a midwife is overlooked—an important development, since a mild case may well become severe within a matter of hours. In contrast to the practice obtaining in many countries, notification of ophthalmia neonatorum in England and Wales does not, therefore, mean notification of proved gonococcal cases; purulent conjunctivitis in the newborn from any cause is notifiable. It is likely that at the time the Order was promulgated it was generally assumed that most cases were gonococcal in origin. This is certainly not true today, and it is fortunate that the Order was sufficiently elastic to cover all cases, for it is not only gonococcal ophthalmia which may lead to disastrous results; other organisms may be equally responsible.

In consequence of the Order, statistical data on the number of cases of ophthalmia neonatorum seen in England and Wales are now available from 1914 onwards. The rate per thousand has shown a slow decline between 1914 and 1944, but it would be fallacious to accept this as undoubted evidence of a decline in the incidence of the affection. Since the purpose of the Order was to ensure that early and adequate treatment was available rather than to provide statistics on ophthalmia neonatorum, the tendency has been to notify cases that are only doubtfully ophthalmia neonatorum. The success of the Order must therefore be judged not by any decline in the number of infants notified, but by the decline recorded almost year by year in the incidence of impaired vision and blindness from the affection. By this criterion, the Order has been brilliantly successful. In itself, the Order was the most significant development in the conquest of blindness from ophthalmia neonatorum, and that was its supreme achievement. But it also served an immensely useful purpose in creating the incidental machinery whereby the newer methods of chemotherapeutic treatment, when they came some seven or eight years ago, could be effectively exploited.

Sulphonamide Therapy

The classical methods of treatment in ophthalmia neonatorum were largely an illustration of the principle of *vix mediatris naturae*. It consisted essentially of almost continual irrigation to remove the pus and so save the cornea from erosion and ulceration. It is true that various agents such as silver nitrate were occasionally used as an antiseptic, but their efficacy was always a matter of doubt. Recovery was, therefore, mainly a question of natural healing by allowing the disease to run its course and preventing pus from destroying the eye. The sulphonamides are a landmark in modern therapy because for the first time an effective anti-bacterial agent had been evolved, and their use in ophthalmia neonatorum was an obvious application. The early results were rather confusing, as the early sulphonamides were not devoid of toxicity and were not so universally effective against a variety of causal organisms as the later derivatives. By 1940 the position had clarified sufficiently to

allow the systematic use of the sulphonamides by mouth in the treatment of ophthalmia neonatorum.

The results obtained at White Oak Hospital, where the London County Council have a special unit for ophthalmia neonatorum, are revealing. In a preliminary series of 273 cases treated with sulphapyridine 61.9 per cent of the infants were cured within eight days, against 15.2 per cent of those treated by the classical methods. These results, striking though they are, were improved upon when a more standardized dosage had been introduced, and a second series of 333 cases showed a considerable proportion with clinical cure within one to three days. It was also found that though the different sulphonamides then available were more or less equally effective, some were better tolerated than others, and ultimately sulphamezathine became the standard drug. Tables I and II show the statistical details concerning these two series.

More significant than the rapidity of cure were the end results. In no case did any corneal complications arise during the course of treatment. Corneal haze was present in a number of babies on admission, and this rapidly cleared with treatment. Twenty babies were admitted with corneal ulceration (all unilateral); in only three cases was the residual scar sufficiently dense to rouse fears as to the ultimate state of vision of the eye.

Penicillin Therapy

Gratifying as the sulphonamides proved, it is likely that sulphonamide treatment is already obsolete in ophthalmia neonatorum. At a special institution like White Oak Hospital, where the necessary nursing and care is available, the use of penicillin for the local treatment of ophthalmia neonatorum has proved remarkably successful. Where the sulphonamides cleared the condition within days, penicillin cleared it within hours.

Two points are essential in the treatment of ophthalmia neonatorum with penicillin. In the first place, adequate concentration of the drops instilled is important. The most consistent results are obtained when the concentration is 2,500 units per c.c. Equally significant is the frequency of application. Penicillin instilled at hourly intervals is effective in clearing ophthalmia neonatorum—sometimes within a matter of hours, but more frequently it takes

TABLE I.—EXPERIMENTAL SERIES OF 273 CASES OF OPHTHALMIA NEONATORUM TREATED WITH SULPHAPYRIDINE.

Clinical Cure	*Local Treatment (Classical Methods)*		*Total*	*General Sulphapyridine Treatment*		*Total*
	Gonococci-positive	*Gonococci-negative*		*Gonococci-positive*	*Gonococci-negative*	
Within 8 days	2	5	7 (15.2%)	43	126	169 (61.9%)
Within 8–30 days	6	21	27 (58.7%)	21	67	88 (32.2%)
More than 30 days	7	5	12 (26.1%)	9	7	16* (5.9%)
	15	31	46	73	200	273

*—Including relapses after an apparent clinical cure.

TABLE II.—COMPARATIVE RESULTS WITH SOME SULPHONAMIDES IN OPHTHALMIA NEONATORUM—333 CASES TREATED WITH FULL DOSES
(0.25 g. on admission and 0.125 g. 4-hourly day and night until 48 hours after clinical cure)

Clinical Cure	*Sulphapyridine*			*Sulphanilamide*			*Sulphamezathine*			*Sulphathiazole*			*Sulphadiazine*		
	Gonococci-positive	*Gonococci-negative*	*Total*	*Gonococci-positive*	*Gonococci-negative*	*Total*	*Gonococci-positive*	*Gonococci-negative*	*Total*	*Gonococci-positive*	*Gonococci-negative*	*Total*	*Gonococci-positive*	*Gonococci-negative*	*Total*
1–3 days	16 (45.7%)	26 (21.5%)	42 (27.0%)	1	6	7 (50.0%)	6 (46.2%)	27 (38.0%)	30 (39.3%)	7 (63.6%)	8 (22.2%)	15 (31.9%)	5	6	11 (34.4%)
4–8 days	13 (37.1%)	74 (61.1%)	87 (55.7%)	—	3	3 (21.4%)	4 (30.7%)	33 (46.5%)	37 (44.0%)	4 (36.3%)	24 (66.6%)	28 (59.6%)	4	12	16 (50.0%)
9–30 days; relapses, poor response and intolerance	6 (17.1%)	21 (17.4%)	27 (17.3%)	—	4	4 (28.6%)	3 (23.1%)	11 (15.5%)	14 (16.7%)	—	4 (11.1%)	4 (8.5%)	—	5	5 (15.6%)
Totals	35	121	156	1	13	14	13	71	84	11	36	47	9	23	32

one to two days. Better results are obtained when the penicillin is instilled at half-hourly intervals, and results are better still when the instillations are at intervals of five minutes. In the last 72 cases treated at White Oak Hospital, penicillin (in a concentration of 2,500 units per c.c.) has been instilled at intervals of one minute and, generally speaking, all pus can be suppressed within thirty minutes. Thereafter a simple conjunctivitis, giving no anxiety, is left which heals within two or three days. For the present, penicillin therapy is not yet sufficiently standardized for explicit instructions to be given for its general use. No doubt this will be evolved, but in the meantime the sulphonamides are still the drug of choice for general purposes.

The Etiology of Ophthalmia Neonatorum

It has already been pointed out that ophthalmia neonatorum is not synonomous with gonococcal ophthalmia. In a consecutive series of 737 cases admitted to White Oak Hospital between September, 1939, and May, 1945, only 180 were found to be caused by the gonococcus. Various staphylococci were responsible for no less than 271 cases, while various bacilli accounted for 119 cases; streptococci, pneumococci, and various other coccal organisms contributed a small quota of cases. A significant finding was the lack of any organism in 126 cases. Not all these showed evidence of the presence of a virus, but it would appear that some 15 per cent of all cases of ophthalmia neonatorum are virus in origin. The recognition that ophthalmia neonatorum can be produced by a whole series of infecting organisms reduces the rôle of gonorrhea as a causal factor considerably, and sharply focuses attention to maternal infections other than gonorrhea. It is, therefore, not sufficient to combat gonococcal infections if ophthalmia neonatorum is to be eliminated. Maternal infections generally—including those due to viruses—have to be considered, and this involves wide issues of antenatal care.

The Prevention of Ophthalmia Neonatorum

The Credé procedure, compulsory notification, and modern methods of treatment have diminished the significance of ophthalmia neonatorum. With modern methods of treatment, blind-

ness from ophthalmia neonatorum need not occur, but no treatment will prevent blindness unless affected infants are treated early and adequately. The public health machinery in the control of ophthalmia neonatorum therefore remains pivotal. These measures have gone far in eliminating the complications of ophthalmia neonatorum, but have still left the incidence of the affection largely unaffected. Attention must now be focused on the prevention of ophthalmia neonatorum itself. The mechanical part of the Credé procedure—cleansing the lids—is invaluable; the value of its chemical component—the application of silver nitrate or its substitutes—must still be regarded as unproven. It is not in the search for better and more foolproof antiseptics than silver nitrate that the hope of eliminating ophthalmia neonatorum lies. Rather is it in an intensive study of the various maternal infections that may lead to the affection, and the creation of public health machinery for the adequate antenatal treatment of such maternal infections. The experience gained in combating ophthalmia neonatorum should be invaluable in the task of eliminating the disease altogether.

Ophthalmia Neonatorum—A Historical Résumé and Present Status in the United States

Harry Wain, M.D., M.S.P.H.

DISCUSSES Ophthalmia Neonatorum, mainly from the point of view of gonorrheal origin.

AMONG the most ruthless of the ravages produced by the gonococcus is the needless blinding of babies and adults. Gonorrheal ophthalmia is the commonest and most serious form of ophthalmia neonatorum, or "babies' sore eyes," and has long been a blight on innocent lives and has made tens of thousands needlessly blind for life. The devilish gonococcus is one of the organisms having a destructive affinity for the human eye. It may gain access to an innocent baby's eyes during birth as the baby's head descends through the infected birth canal of its mother, or, after birth, through contact with contaminated fingers, towels, or soiled linens.

Gonorrheal ophthalmia, whether it occurs at birth or at any time in life, is always a serious disease, but exhibits various degrees of severity. Cases in which there is a slight infection, or in which the disease has been contracted from a chronic gonorrhea, are the mildest. The period of onset may vary from twelve hours to three days, but may be delayed as long as two weeks. Commonly, the first symptoms are noted on the second or third day after exposure to infection. The first symptoms consist of great swelling, redness, and tenseness of the eyelids, so that they cannot be opened voluntarily and can be separated only with difficulty. The conjunctiva of the eye is reddened and swollen and a thin secretion occurs. The eye is tender and painful to the touch. A very profuse discharge of pus soon appears and escapes from between the eyelids.

If neglected or not properly treated, the cornea or visual area of the eye soon ulcerates. In such cases, even if the infection is then checked, a scar or opacity appears where healing takes place, and vision is forever affected. In less favorable cases, where the disease succeeds in forcing a perforation of the cornea, the interior of the eye is infected and the whole structure is destroyed, leaving only a shrunken, sightless globe and permanent blindness.

Ophthalmia due to gonorrheal infection most certainly is as old as gonorrhea itself, which we know to be as ancient as the history of mankind. While accurate descriptions of gonorrhea as a genital disease exist in our earliest medical records, little or no mention is made of either gonorrheal ophthalmia or any other type of ophthalmia neonatorum. However, Aetius, who wrote about the year 500, mentions ophthalmia neonatorum in his system of medicine. It took a long time to find out that gonorrhea was a cause of ophthalmia neonatorum, and even when this fact was ascertained, it was long denied the recognition it deserved. During the eighteenth century, physicians reported the possibility that the mucus of the birth canal or more frequently a maternal vaginal discharge produced an inflammation of the eyes, frequently followed by blindness. Desessartz believed that infection of the eyes of newborn babies could be prevented by rubbing the saliva or spittle of a healthy person into the babies' eyes. It had already been the custom in many countries for unknown centuries to drop oil into the eyes of the newborn babies.

In the year 1750, S. T. Quellmatz hit upon the truth; he discovered the cause to be in the vaginal discharge of the mother at the birth of the child. Unfortunately for humanity, this discovery was neglected and not accepted.

However, the truth and the keen observation of men of medicine again made themselves heard, and in 1807 Dr. Benjamin Gibson of England wrote his observations that the child's eyes were infected from the mother's gonorrheal condition. Dr. Gibson's thinking and observations were so clear and sound that they might have been written today instead of in 1807. For he says: (1) remove the disease, if possible, in the mother during pregnancy; (2) if that cannot be done, remove artificially as much of the discharge as possible from the vagina at the time of delivery; (3) at all events,

pay particular attention to the eyes of the child, washing them immediately after delivery.

Two other medical men with an experimental turn of mind carried out experiments which proved that "babies' sore eyes," or ophthalmia neonatorum, was commonly caused by gonorrhea. Vetch in 1820 took pus from a baby's eye and inoculated the canal of the penis in a male patient and produced gonorrhea. Pauli of Landau in 1854 took pus from a baby's eye and introduced it into the vagina of a prostitute and produced gonorrhea in her.

Yet the truth that blindness in babies frequently came from the infection of the mother was slow in being accepted. The ignorant idea prevailed in those days that the disease represented the chastening dispensation of providence, and as such was to be meekly borne. The doctors and the public of that day ascribed all kinds of causes to account for the disease, such as exposing the child's eyes to light too soon after birth, to cold, to heat, to the condition of the bowels, or to getting into the child's eyes some of the material used in cleansing the baby.

It was not until 1879 that Albert Neisser of Breslau, Germany, the discoverer of the gonococcus, announced and proved to the world that the germs of gonorrhea were frequently to be found in the pussy secretions from "babies' sore eyes." Thus it was proven conclusively, at long last, that the gonococcus, which does so much damage to men and women, was also a blinder of babies.

Following shortly on the heels of this discovery came one of the greatest triumphs of preventive medicine. In the years 1880, 1881, and 1882 Dr. Karl Sigmund Franz Credé, professor of obstetrics and gynecology at the University of Leipsig, Germany, and director of the Leipsig Lying-In Hospital, systematized and published a method of preventing this dread disease and thus conferred upon succeeding generations an everlasting benefit. The method was unbelievably simple and sure, and made this once most dreaded, blinding disease one of the most preventable of all preventable diseases.

The method described in his own words follows: "The eyelids were gently separated by an assistant, and by means of a glass rod a single drop of the solution (2 per cent silver nitrate) was placed in each eye. For twenty-four hours after the application, the eyes

were cooled by means of a linen fold, soaked in salicylic acid (2:100) laid over them." Later it was found that a 1 per cent solution of silver nitrate dropped into the eyes of newborn babies was as effective as the 2 per cent solution and that it was unnecessary to cool the eyes after the application by means of the linen fold soaked in salicylic acid, thus making the method simpler still.

In Credé's hospital in the year of 1874 there were 323 births with 45 cases of gonorrheal ophthalmia, or 13.6 per cent; and in 1882 in 260 births, where the method was used, but one case developed, or only 0.5 per cent. In clinics where Credé's method was tried, it was found that the rate of gonorrheal ophthalmia dropped from one out of every ten newly born babies contracting the disease to one case in one thousand births. Thus Credé became immortal as the "saver of sight" for countless thousands of newborn babies.

However, the battle against the blinding ravages of the gonococcus was not yet won. Despite the fact that the cause of the disease was clearly proven and that a simple, harmless and absolute preventive had been scientifically demonstrated, the needless blinding of babies continued.

Ignorance, carelessness, and prudery on the part of doctors, midwives, and the public held back the universal use of Credé's method. Many doctors, while using the method on their charity and hospital cases, were reluctant to use it for their private patients, fearing to offend them because they felt the use of the preventive drops of silver nitrate implied their patients might have gonorrhea. Unfortunately for the doctors and their patients, and still more so for the poor, helpless babies, many of the private patients did have gonorrhea and their babies' eyes became infected. How slow the medical profession was in adopting Credé's method of prophylaxis is shown by an investigation which was made in Boston in 1909, twenty-seven years after Credé's conclusive demonstration of his preventive method. The investigation revealed that of 97 doctors visited who had large obstetrical practices, only 27 always used a prophylaxis, 40 seldom used any, and 28 never used a recognized preventive. For those poor, ignorant mothers who were entrusted to the care of midwives, the situation was even worse. For not only were the midwives uneducated in preventive medicine, but nine out of ten were incompetent and unclean. Yet in 1904 records

showed that 86 per cent of all births that were reported in the United States were attended by midwives. Mothers and fathers objected to the drops being instilled in their babies' eyes, feeling that the use of the preventive branded them with the stigma of having gonorrhea.

Small wonder then that the needless blinding of babies continued and constituted a serious indictment of criminal carelessness and ignorance of the doctors, midwives, and parents of that day and age. However, the dramatic results that were repeatedly demonstrated in preventing ophthalmia neonatorum wherever Credé's method was used, were not to be ignored. Clear-thinking doctors, medical leaders, and commissions for the blind cried out for the universal use of Credé's method and agitated for legislation making its use compulsory.

Legislation for the control of ophthalmia started in the United States in New York State in 1890, ten years after Credé's great discovery. The legislation consisted of the required reporting of cases to the health officer or to a legally qualified physician. Dr. Lucien Howe of Buffalo, New York, was one of the leaders in the fight for this legislation and the law became known as the Howe Law and was copied by many other states. As the result of the appointment of a special committee by the American Medical Association in 1906 and the organization in 1908 of the New York State Committee for the Prevention of Blindness (which later became the National Society for the Prevention of Blindness), public opinion was aroused to support and pass mandatory laws requiring the use of a prophylactic in the eyes of the newborn. These laws vary in the different states but, in general, they require the reporting of cases, free distribution of silver nitrate and, most important, the use of preventive drops. According to statistics furnished by the National Society for the Prevention of Blindness, in 1945 all forty-eight states and the District of Columbia require the reporting of cases of ophthalmia neonatorum, and all but two require the use of a prophylactic in the eyes of the newborn.

The importance of the prompt and efficient treatment of cases of ophthalmia neonatorum was also recognized. No longer was it fashionable to allow ignorant midwives or superstitious old women to treat this disease with such inefficient remedies as drops of

mothers' milk or drops of urine from a virgin into the eyes, tea leaves, camomile tea or lard, while the disease continued unchecked to blind the baby.

With education, publicity, and the passage of laws which required the reporting of the disease to health departments, many infected babies were saved from blindness by proper and prompt treatment. For years the treatment was difficult and somewhat uncertain in results, consisting of iced compresses, frequent cleansings, and the instillation in the eyes of silver solutions such as argyrol or protargol. Until recently this type of treatment was all that was available and required expert care, constant nursing attention, and preferably hospitalization of the infant. With the advent of the sulfa drugs, the treatment was greatly improved and the administration of these drugs and instillation of sulfa ointment in the eyes did much to shorten and simplify the treatment. The discovery of penicillin has revolutionized the treatment of this disease, so that now the use of penicillin has made the cure quick and simple if used in time.

Thus ophthalmia neonatorum, the dread blinder of babies, has almost been conquered and the disease which had been responsible for 30 per cent of all cases of blindness is now responsible for only 2.4 per cent of blindness.

As can be seen from these figures, all danger from this disease has not yet been eliminated, for Credé's prophylaxis and prompt treatment of cases does not strike at the root of the evil. To be absolutely safe from the blinding danger of the gonococcus, gonorrhea itself must be eradicated. For even if the prophylactic drops are used and the mother has gonorrhea, she may carry infection to the baby's eyes after birth by means of contaminated fingers or washcloths. Also a careless nurse or other person caring for the baby, if she has gonorrhea, can infect a baby's eyes. If the prophylactic drops are not properly or carefully used, infection may occur. Adults also may get gonorrheal ophthalmia through carelessness.

Ophthalmia neonatorum, whether it be caused by the gonococcus, pneumococcus, streptococcus, or any other organism, still remains a real hazard and danger and is still a cause of needless blindness; and it will continue to be so until these germs are conquered.

An Eyesight Survey of Thirty Plants

Joseph Lo Presti, M.D.

SOME of the facts revealed in a recent study of the eye service provided by leading industries in the state of Connecticut.

AN unusual opportunity to study at close range the visual conditions and practices prevailing in a group of industries was offered during the final period of the war. The findings were remarkably similar to those of an earlier survey conducted through correspondence by the National Society for the Prevention of Blindness. Thus they undoubtedly indicate conditions that exist quite generally throughout industry and emphasize the problems that now demand most serious attention from the standpoint of vision conservation and efficiency.

The Connecticut survey which will be outlined in this article was made in 1944 by the United States Public Health Service and the National Society for the Prevention of Blindness, in cooperation with the Bureau of Industrial Hygiene of the Connecticut State Department of Health. It covered 30 plants, with a total of 127,372 employees, engaged largely on government contracts. Emphasis should be placed on the fact that all these concerns were cooperating with the Connecticut Bureau of Industrial Hygiene. For this reason they constituted a select group and were not necessarily representative of all plants operating in this region during the war period. It may be assumed that they gave better than average attention to eyesight conservation and protection.

The objectives of the study were to obtain a cross section of industrial vision practices; compare various methods of examination, particularly screening tests; and derive recommendations for methods of improving existing conditions. Although an attempt was made to carry out a complete survey at each location, most plant situations

would not permit this. Thus in some instances only certain departments were inspected, while in others only a discussion of the most pressing visual problems could be held. The medical director, ophthalmologist, physician-on-call, safety supervisor or whoever had the final responsibility for the plant's eye program or eye care suggested the extent of the survey. For all plants visited, the Industrial Eyesight Protection Appraisal Form* was filled out in detail. A summary of the data thus collected appears in Table 1.

Professional Guidance Lacking

It will be noted that the general medical program presented a reasonably satisfactory picture.

Full time, general medical supervision was provided in one-third of the industries. Ninety-two per cent provided plant nursing service, and about one-half of them extended this service to the home as needed. First aid facilities were found in 92 per cent of the plants.

In contrast to the above, the eye service showed so many deficiencies that instead of "picture," the term "sketch" seems more appropriate. These deficiencies were particularly serious in relation to the most important factor—professional service and supervision —as the following facts show.

Special eye services were made available through employment of an ophthalmologist in 75 per cent of the plants. None had full-time or part-time services of the ophthalmologist at the plant. In every case this arrangement simply meant that eye cases—usually injuries—were regularly referred to one of several local ophthalmologists. In some cases (10 per cent) signed, written orders for the first-aid treatment of eye injuries were provided. Yet in no instance was supervision or personal instruction given to the person actually administering the treatment.

Despite the finding that 85 per cent of the plants had rules for wearing goggles, only six per cent provided optician's service. Again, in no instance did the optician ever visit the working area, or have first-hand knowledge of working conditions in the plant to guide him in selecting type and height of bifocal segments or proper kind of safety eyewear.

* Publication 402, National Society for the Prevention of Blindness.

TABLE 1.—A SUMMARY OF THE DATA COLLECTED IN THE SURVEY OF 30 CONNECTICUT PLANTS, TOTAL EMPLOYEES: 127, 372*

Section A—Administrative Program

1. General Medical Supervision:	
Complete	33%
Partial	53%
2. Industrial Nurse Available for:	
Plant service	92%
Home service	46%
3. First Aid Facilities Include:	
Hospital room	92%
Eye fountains or showers	6%
First aid kits	59%
4. Health and Safety Education Program Includes:	
Instruction on eye health	79%
Instruction on eye safety	66%
5. Special Eye Services Made Available through:	
Eye physician (ophthalmologist)	73%
Optometrist	0%
Optician	6%
6. Screening Test for Acuity Given Only to:	
All employees	66%
Employees in selected occupations only	0%
7. Screening Test for Acuity and Other Visual Functions Given to:	
All employees	26%
Employees in selected occupations only	0%
8. Screening for Occupational Vision Done under Direction of:	
Eye physician	6%
Optometrist	0%
Plant physician	33%
Nurse or other trained person	66%
9. Periodic Recheck of Occupational Vision:	
All employees	20%
Employees exposed to special hazards	13%
Employees with poor production record	6%
Employees involved in accidents	13%
Where original screening disclosed need for follow-up	33%
10. Periodic Examination Made by Eye Physician for:	
Radiation exposure (welders, etc.)	13%
Exposure to toxic fumes or gases	13%
Systemic toxic exposure	13%
Follow-up of discovered defects	13%

* Because the items as they appear in the appraisal form do not cover all the possible ways of describing provisions and practices adopted at all plants, the total for any one item may be more or less than 100 per cent.

TABLE 1.—A SUMMARY OF THE DATA COLLECTED IN THE SURVEY OF 30 CONNECTICUT PLANTS, TOTAL EMPLOYEES: 127, 372 (*Continued*)

11. Prescription Lenses Provided by:	
Company, for all employees	13%
Company, for only employees in hazardous work	0%
Employee with company assistance	33%
Employees alone	33%
12. Source of Prescriptions for Lenses:	
Worker's personal prescription	66%
Refraction made in the plant by company examiner	6%
Refraction made outside by other qualified person at direction of company	6%
13. Job Analysis for Occupational Vision Made with Cooperation of:	
Eye physician	6%
Optometrist	0%
Other person trained in subject	6%
14. Illumination Conforms to "American Recommended Practice of Industrial Lighting":	
Yes	13%
No	33%
Don't know	57%
Section B—Protective Program	
15. Hazards Generally Guarded at the Source:	
Yes	100%
No	0%
16. Accident Reports Include:	
Results of eye test of all principals	0%
Quality of illumination at scene of accident	0%
17. Employees Engaged in Operations Where the Wearing of Goggles or Other Eye Protective Equipment is Desirable:	
Yes	0%
No	0%
(If answer to No. 17 is "No," disregard the remaining questions)	
18. Rules for Wearing Goggles:	
Yes	86%
No	0%
19. Rules Apply to:	
All, including officials and others when in plant	13%
Workers only	7%
Persons exposed to special hazards only	66%
20. Wearing of Goggles Enforced by:	
Warning	79%
Discharge	0%
Discipline	6%
Committee action	13%

TABLE 1.—A SUMMARY OF THE DATA COLLECTED IN THE SURVEY OF 30 CONNECTICUT PLANTS, TOTAL EMPLOYEES: 127, 372 (*Continued*)

21. Every Exposed Worker Supplied with Individual Goggles:	
Yes	86%
No	0%
22. Ordinary Goggles Fitted for Comfort:	
By optician	6%
By trained person	26%
Other	6%
23. Prescription Goggles Fitted on the Worker at His Job:	
Yes	6%
No	0%
24. Who Fits Prescription Goggles:	
Optician	19%
Trained person	6%
Other	0%
25. Local Lens-Cleaning Kits in the Plants:	
Yes	6%
No	0%
26. Individual Equipment Regularly Reconditioned:	
Monthly	0%
Quarterly	0%
Currently	0%
No	100%
27. Individual Equipment Sterilized:	
Monthly	0%
Quarterly	0%
No	0%
28. Equipment Sterilized Before Re-Issue:	
Yes	13%
No	0%

Vision Tests Incomplete

As to pre-placement eye examinations, the study revealed that 66 per cent of the plants included no screening test other than visual acuity at distance. Only one had a suitable testing setup for this—a projecto-chart. No attempt was made to provide recommended levels of illumination in any of the plants.

Screening tests for acuity plus other visual functions were given in 26 per cent of the establishments. Six of the eight which this group comprises gave color vision tests, using methods too crude to be reliable. The remaining two plants used the Telebinocular, and in

both cases this was administered by persons without previous supervision or training in the use of the apparatus.

Screening was done by the ophthalmologist in his office in six per cent of the concerns, by the plant physician in 33 per cent, and by the plant nurse in 66 per cent. The nurse in no instance had had previous supervision or instruction in the techniques involved, nor had there been any inspection of the apparatus used for the vision testing.

There were corresponding shortages in other vision testing procedures—periodic rechecks, periodic examination of employees exposed to special hazards, radiation, toxic fumes, etc., as shown in Table 1.

Although careful job analysis and the fitting of prescription lenses at the job are vital to eyesight efficiency and conservation, both of these factors were generally overlooked. In 66 per cent of the companies, the employees' personal (reading) prescriptions were used for corrective lenses in goggles and other protective equipment; this, despite the fact that working distance on many operations is greater or less than reading distance.

Protective Features

As is generally the case throughout industry, more attention was given to protecting eyes from injury than to the other items of the vision program. For example, hazards were guarded at the source in 100 per cent of the plants, and 86 per cent had established rules for wearing goggles. Inspection trips through the working areas, however, showed that enforcement of these rules by warning was ineffective in every case. Ordinary goggles were fitted for comfort in few plants, and where opticians were employed for fitting prescription goggles they were not familiar with the working conditions involved. Only two plants provided lens-cleaning kits and these were too few to serve more than a small fraction of the employees needing such facilities.

Though all concerns complained of the scarcity of goggles, none did any reconditioning of individual equipment nor was there any regular procedure for sterilization.

Remedial Measures

In view of the self-evident need for promoting standard vision practices in the area surveyed, it was decided to attack the problem from every possible avenue of approach. Thus contact was made

with as many of the following as were employed by each of the concerns: medical director or physician-on-call; consulting ophthalmologist; plant superintendent; nursing staff; safety director; quality-control engineer; personnel director; and industrial psychologist. Commenting briefly on some of the interviews with these specialists:

Medical Director.—The outline of a complete eye program was explained to him in detail and the appraisal form was then filled out. As deficiencies were uncovered, the extent and manner of correction were discussed. The type of survey to be made in a particular plant evolved after the procedures, techniques, and equipment were demonstrated. A universal complaint of medical directors, both full-time and part-time, was that ophthalmological personnel either was not available in the plant area or was too busy to give direct assistance in formulating policies, standards, or programs regarding employee vision examination and protection.

Ophthalmologist.—In not one of the plants inspected was there retained an ophthalmologist except on an "on-call" basis. Emergency care of injured employees referred to the physician's office and, occasionally, refraction of prospective employees who failed to pass the eye examination, comprised the sum total of the ophthalmologist's industrial activities. No direct or indirect contribution was made to the safety goggle programs, screening projects, or the eye portion of the pre-employment physical examination. With respect to the latter, in almost every plant visited visual standards for employment were laid down arbitrarily by the medical office without the benefit of ophthalmological opinion. These standards were not different for different jobs, but merely fail or pass in most instances. There was no attempt to relate placement to visual test results.

In only a few plants were any kind of signed standing orders available to guide the nurse in handling eye injuries. Further specific instruction and supervision of the techniques involved or use and maintenance of special equipment required for carrying out the standing orders were not provided by the ophthalmologist in any plant included in this study.

Nurse.—Careful inspection was made of the nurse's station and eye care equipment. Standing orders, usually of obscure origin and only rarely signed by the physician, were scrutinized. It was only necessary to ask for a demonstration of the care of the commonest

eye accident, a foreign body, to discover widely varying practices pointing to the total absence of supervision and guidance by an ophthalmologist. Much the same comment can be made regarding the part that the nurse plays in the visual examination and screening program.

In an attempt to standardize nursing care of eye cases a demonstration eyetray was assembled. With the assistance of the Connecticut Bureau of Industrial Hygiene and its nursing consultant, a photograph of the tray together with a descriptive legend and an outline of measures to be taken in the treatment of eye injuries and infections were made available for distribution to the industrial nurses in the state.

Safety Director.—Discussions with various safety directors readily uncovered the fact that general safety measures were, on the whole, more adequate than eye safety measures. For example, not one goggle-cleaning station was provided in any of the plants even four months after such equipment had been suggested and information on how to secure it had been made available. Accident reports did not include any information on the vision of the injured or the principal persons involved, or on the quantity or quality of the illumination at the scene of the accident.

The talks with these key individuals directly involved in the administration of the industrial eyesight program further emphasized the gross deficiencies—greater in number and more serious in degree than those found in the administration of general industrial health service.

Special Screening Studies

An attempt was made to institute special screening surveys in seven of these Connecticut plants, employing the following methods: short ophthalmic examinations,* Telebinocular, Ortho-Rater, and Sight-Screener (Vectograph). Each of these methods was demonstrated in the medical office of every plant. The apparatus for the survey was

* An outline of this examination is described in "Vision Appraisal," prepared in cooperation with the National Society for the Prevention of Blindness by the Eye Health Committee of the American Student Health Association and the Advisory Committee of Ophthalmologists, representing: American Academy of Ophthalmology and Otolaryngology, American Ophthalmological Society, and the Section on Ophthalmology of the American Medical Association.

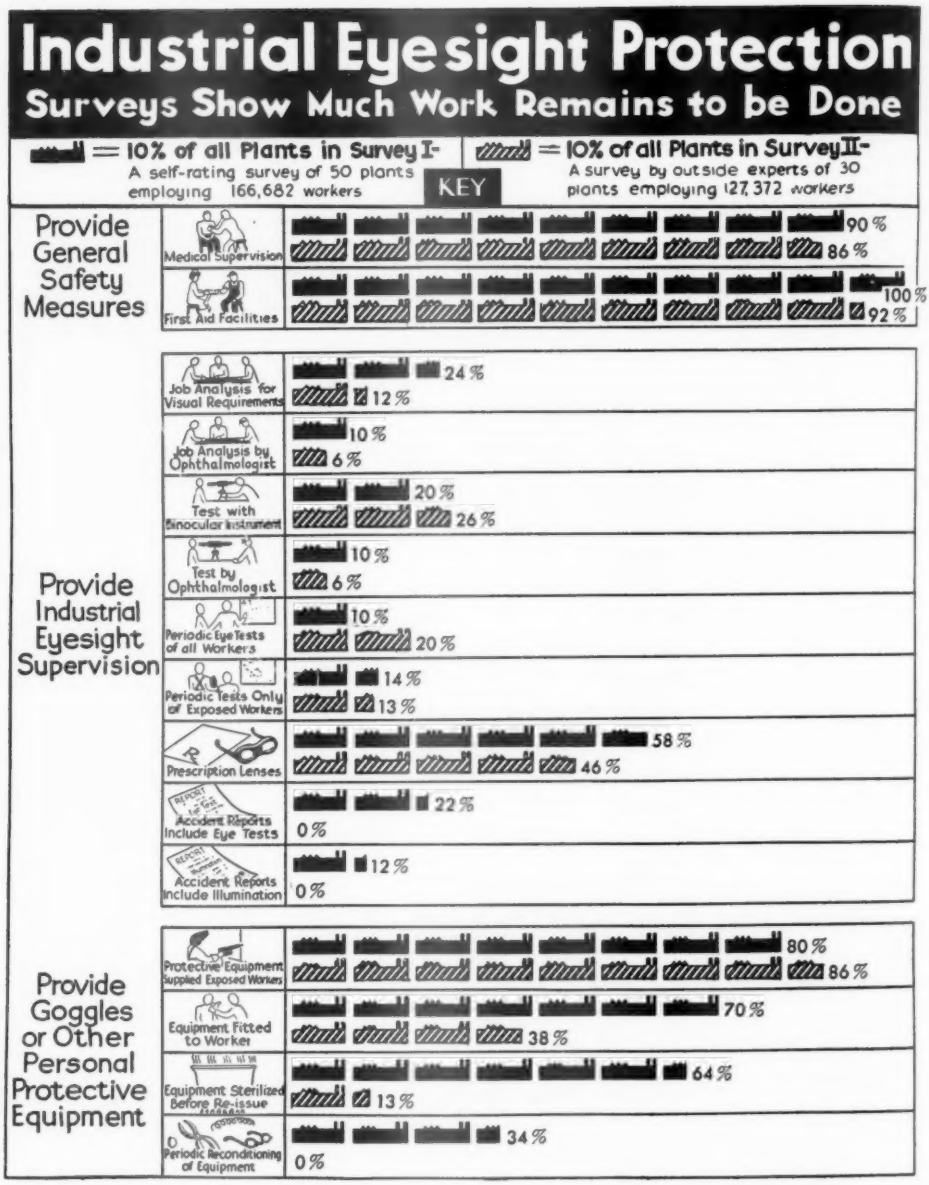

FIGURE 1.—A Comparison of the Study, Made by Outside Experts, of 30 Connecticut Plants With a 1941 Self-Rating Survey of 50 Plants. The Findings Show a Remarkable Similarity and Indicate Gross Deficiencies in Vision Programs as Compared With Those Relating to General Industrial Health.

then left at the plant to be used in whatever manner the medical office or management prescribed.

In two of these industries the nurse was assigned to the task of running the tests. In the remaining five the responsibility was given respectively to a production engineer, a safety director, an employment clerk, a trained first aider, and an industrial psychologist.

In only two of the seven plants which undertook a screening survey were the data reliable enough to permit reasonable analysis and in only two plants could satisfactory employee-evaluations be obtained; that is, sufficiently critical to expect them to correlate with the test made.

The findings of three of these selected screening studies—in plants manufacturing small arms, aircraft engines and electric communication equipment—are included in the complete report of this Connecticut survey which is available in the library of the National Society for the Prevention of Blindness. Briefly, it may be said that screening, still in its later stages of newness and development, has not been accepted as a routine procedure in industrial medical practice in this region. There is some justification for this in view of the scarcity of ready information on the subject in past and current medical literature.

It is evident from these special studies that visual screening is worth while from the standpoint of production, and at least is a contribution to the rational selection and allocation of employees. Constant surveillance by the ophthalmologist is needed to insure proper administration of the tests, adequate interpretation of data, and judicious application of the results obtained.

Screening should be confined to its proportionate and proper place in an over-all industrial vision program. The program should stress above all else eye health—the early recognition of functional and structural eye changes so that immediate thorough care may be provided to preserve vision and maintain a high standard of employee skill and working capacity.

Comparing the results of this survey with those of another made in 1941 (Figure 1), striking similarity will be noted. In the latter case the 50 plants made self-appraisals of their vision programs and reported by mail to the National Society for the Prevention of Blindness. Both studies indicate the acute shortages, and furnish a valuable guide in planning postwar improvement.

A Public School Program for the Visually Handicapped in Oregon

Ethel Nestell Fortner

DESCRIBES a unique educational program for partially seeing children.

ROSALIE had cataracts. When she was six her ophthalmologist recommended that she attend school part time her first year for socialization, but that reading be postponed until further needling had given her enough vision to read large print. She attended a two-teacher rural school. The primary teacher was most cooperative and Rosalie was very happy in her first school experience. Sight conservation materials were made available to her mother and teacher so that as soon as Rosalie's eyes were ready her reading experience could begin. All through the first and second grades Rosalie used and needed her Clear Type books and wouldn't part with her adjustable desk top, but by the following year she had no need for special helps. Her vision was now adequate for regular public school work. She was a happy little rosy-cheeked third-grade girl as she grinned and told me, "Now I can read the same books as the other kids." This is but one illustration of the equalization of educational opportunity for the visually handicapped child now possible under Oregon's special education program.

Ben is an older boy who, in a similar school situation, did not have such help at the time it was needed. Ben had done three years of school work when an eye accident occurred that necessitated a prolonged period of surgery and treatment. At that time special help was not available in the public schools. The only sight-saving classes in the state were those in the public schools of Portland or in Salem in the Oregon State School for the Blind. Ben's mother

steadfastly refused to send him away from home although these facilities were suggested to her by the ophthalmologist, the county health department, and the school authorities. After four long years, when he should be ready for high school, he is a shy, retiring, over-age misfit in the fourth grade of his little country school. He now has the use of sight-saving equipment and some individual teaching has been arranged to help him catch up the lost years, but this is a poor substitute for the happier and more normal educational experience he has missed.

The Oregon program for handicapped children is concerned not only with children who have educational problems because of vision loss, but also provides aid and supervision to the hard-of-hearing children, children with speech difficulties, crippled or homebound children, and those who experience learning difficulties that cause maladjustment, exclusive of mental retardation. It has assisted in the establishment of special classes in public schools and adequate educational facilities for hospitalized children. It has made it possible for school systems to employ special teachers for remedial reading and speech correction that could not otherwise have afforded it. It has provided the schools of the state with a program of supervision to assist them in finding and helping children with speech, hearing, and vision difficulties in the regular classroom.[1, 2]

The supervisory program includes provisions for teacher training and educational clinics. The teacher training includes county institutes, extension classes during the school year, and summer school courses. All of the elementary teachers of the county are required to attend the county institute and a day is devoted to "What the Teacher Can Do for the Handicapped Child." Extension and summer school classes bring to smaller numbers of classroom teachers and administrators more detailed information on the needs of handicapped children. The educational clinics that follow the institutes provide an opportunity for the supervisors to see children with vision, hearing, and speech problems, and advise on these problems with the teacher and the parent.

[1] Bain, V. D.: "State Supervisory Program for the Visually Handicapped." Proceedings, American Association of Workers for the Blind, 1943, p. 78.

[2] Bain, V. D.: "New Developments in the States, VI: Oregon." Journal of Exceptional Children, Vol. XII, No. 1: October 1945, p. 14.

Inservice Training

Teachers test vision at the beginning of the school year as part of a general school health inspection requirement. Instructions for screening are given in the Oregon Manual for the Use of the School Health Record Card and on the back of the Symbol E chart provided to all teachers. These instructions were prepared by the Oregon State Board of Health based on procedures approved by the National Society for the Prevention of Blindness.

The portion of the institute devoted to vision always includes instructions on, and a demonstration of, Snellen testing. It is suggested that in addition to the regular screening teachers test new pupils who enter late, and re-test after illness or correction. It is pointed out that impairment of vision is far more general than is usually realized and that unrecognized eye difficulties may be the basis of a child's educational or behavior problem. A Snellen demonstration provides opportunity to stress glasses hygiene: cleanliness, protection, care, need for adjustment, and rechecks. Testing the light on the chart for the demonstration introduces the use of the light meter which schools are encouraged to own. Suggestions are made for improving schoolroom lighting by cleanliness, redecoration, and better use of shades.

Teachers are cautioned that symptoms of eyestrain are fully as important as the results of the Snellen test, since a child may have normal visual acuity as measured by the Snellen test and still suffer from eye irritations that may be upsetting him. Vision should be both clear and comfortable, so the teachers are asked to watch for redness, watery eyes, crusts along the lashes, complaints of headaches, blurring or sensitivity to light, excessive squinting or head tilting.

Teachers are also asked to keep careful records on the health record that is specially designed for the general health inspection. The value of the health record card is stressed since it serves as a basis for teacher-nurse conferences and helps to determine whether the child's eye condition is a factor in his educational adjustment. A carefully kept health record card is an invaluable asset to a child as it becomes cumulative and follows him throughout his school career.

Teachers are instructed to (1) refer a child for further attention if he has a visual acuity of 20/40 or less, symptoms of eyestrain, or

any tendency for his eyes to cross; (2) urge attention to his eye condition but avoid stating that the child needs glasses or in any way presuming to diagnose; (3) suggest re-examination if it has been a year or more since he was last examined, if his glasses are in poor condition, or if he has difficulty wearing them.

Common-sense eye care for all school children is reviewed as follows:

> Children should not be seated facing the light. Do not stand in front of the windows when teaching. Make the best use of lighting facilities available to you by control of shades to let in light but eliminate glare, by cleanliness of luminaires, windows, walls, and woodwork, and by use of artificial light as needed.
>
> Periods of close eye work should be broken by periods that provide eye rest. Closing the eyes for a few minutes rests them. Changing focus by looking away from close work is relaxing.
>
> Good reading posture with head up and reading material on reading level is best not only for the eyes but for the general health.
>
> Correct reading distance is 14 to 16 inches. Encourage all children to hold their books as far away as they can see them comfortably. Many children hold reading material much closer to their eyes than is necessary or desirable.
>
> Seat the child where he can see board work, charts, and demonstrations. Allow him to move about the room, if necessary, in order to see everything. If he cannot see what goes on, he loses interest and becomes discouraged.
>
> If his eyes tire easily, avoid excessive or unnecessary reading. Encourage listening habits. Get parents or other children to read long assignments aloud to him. Refrain from long periods of eye use after illness.
>
> The child's health may affect his eye condition. Encourage adequate rest, a balanced diet, and a normal amount of outdoor activity. High health standards are doubly important for the child with a vision problem.

After the demonstration and explanation on general classroom eye care have been given, the special equipment and services that the Division of Special Education can provide to the regular classroom teacher for the use of the child who cannot see what is on the chalkboard, who cannot see to read ordinary textbooks, or whose

eye use has been limited by his eye specialist, is explained.[1] The Division of Special Education, and the Oregon State School for the Blind have pooled their resources in order to avoid duplicating facilities. Therefore, the schools of the state have access to over $6,000 worth of sight conservation materials and equipment for the use of visually handicapped children who are under supervision. The combined Clear Type library contains over 900 titles. The Clear Type titles chosen by the teacher as best suited to the child's needs are ordered from the Division of Special Education. The order is filled by the librarian at the Oregon State School for the Blind.

Educational Clinics

Specific instructions for referring children with vision problems to the educational clinic are given to the teachers at the county institutes. It is explained that educational recommendations will be made at the clinics only if the child is under the care of an eye specialist. He may be scheduled for the clinic because his vision with glasses is less than 20/40, because his vision without glasses is less than 20/70, because he has low vision that cannot be corrected, because he is unable to wear his glasses, has crossed eyes or constant symptoms of eyestrain.

If the child is not under the care of an eye specialist, he may be referred to the clinic if he has 20/40 vision or less, crossed eyes or eyestrain, and the parents will be urged to place him under the care of an eye specialist. Sometimes this is helpful in motivating the parent to action by showing just what the problem is and why the school is concerned.

A few weeks after the institute, the educational clinic is held in the county. The county school superintendent in cooperation with the local school authorities arranges a schedule and each child to be seen has an appointment. The parent accompanies the child and if the school can arrange to relieve the teacher, she is also present. The child's health record card and the teacher's reason for referral are available to the clinician. At the educational clinic a further screening takes place based on the child's complaints, the appearance of

[1] The Division of Special Education provides bulletins, describing this service, upon request. These are entitled: "How to Find and Help the Visually Handicapped Child," "Helping the Visually Handicapped Child in Your Classroom," and "Save Your Eyes."

his eyes, a muscle balance test, a Snellen, and a near vision test. The problem is then discussed with the mother and recommendations for home and school care are made. About 20 minutes per examination are allowed and careful records are kept.

Evaluating Results

During the last two school years, 2,700 children have been seen in educational clinics in the 36 counties and 150 of these children have had the use of large-type books, sight-saving materials, or a reading service in their own classrooms. If these figures seem small it must be remembered that Oregon is a rural state with but one large city. The total school population outside the City of Portland is 154,000 children attending schools scattered over the 96,000 square miles of the state. However, the program is still too young to determine exactly how many children have been helped or how many handicapping conditions alleviated or averted. The effectiveness of the program can best be illustrated by citing a specific example.

One of the Oregon coast counties stretches for about 60 miles along a wild sweep of rugged shore line and back into the heavily timbered coast range for about 30 miles. In this resort area along the Pacific there is a series of little coast towns partially supported by sportsmen and vacationists. Two of the towns are harbors, secluded coves, where tall-masted deep sea trollers ride at anchor. Fishing, lumbering, and dairy farming are the chief industries that support the 15,000 population. The county seat is a lumber mill town.

In this county 120 teachers handle the instruction of 2,400 children in 26 schools. One county health nurse travels 1,800 miles per month bringing health services to the schools and homes. Parents have to travel from 150 to 270 miles to reach communities where a selection of services by specialists in eye care is available. One optometrist is located in the county.

In September of the current school year, the teachers were instructed at the county institute. Between that time and the educational clinics held in December, the teachers did the vision screening. This inspection resulted in 300 children being referred to the health nurse for rechecks, about 150 of whom were referred to the

educational clinics. To date, the health nurse has received reports from eye specialists[1] giving their diagnoses of, and recommendations for, 110 children examined during the current school year. These reports have been sent to the state supervisor's office for comments or educational interpretations, and then have been placed in the hands of the teachers to be filed with the school health record cards. This procedure makes it possible for the teacher to assist in follow-up of home care and rechecking. It is an invaluable guide in enabling her to do an intelligent job of schoolroom care. In the last 25 reports to come to the supervisor's desk, the cases were diagnosed as follows: 12 cases of myopia or myopic astigmatism; seven cases of hyperopia or hyperopic astigmatism; four cases of strabismus; one of amblyopia, and one of conjunctivitis. These are typical of cases found in public schools and referred to eye specialists by teachers and health departments. The parents of 19 of these children sought specialized service outside their own communities.

A subsequent visit to this county revealed the following example of parental response: a mother attended the clinic with her six-year-old daughter and learned of the importance of early care for strabismus. Her child's eye condition is now corrected and, due to her influence on another mother, a pair of four-year-old cross-eyed twins have now been completely corrected—an indirect result of the emphasis on vision in this county.

Coordination With Other Agencies

The legislation making this program possible contains a special feature: "The Superintendent of Public Instruction shall cooperate with the existing agencies concerned with welfare and health of handicapped children; and coordinate their educational activities in the interest of handicapped children; and these agencies are hereby empowered to cooperate with them."[2] This coordination has made possible elimination of the duplication of effort, personnel, equipment, and services.

Many agencies have contributed to the success of the vision pro-

[1] "Report on Eye Examination," designed by Oregon State Board of Health and State Department of Education, in cooperation with the State School for the Blind and Oregon State Medical Society.

[2] "1941 Supplement to the 1937 Oregon School Laws," issued by Rex Putnam, Superintendent of Public Instruction. Chapter 480, Oregon Laws 1941, § 35–3100, Section 4.

gram conducted by the Division of Special Education in the public schools: the State Board of Health; the State School for the Blind; the Oregon State Medical Society; the Oregon Optometric Association; the Oregon State Library; the State Public Welfare Commission; the University of Oregon Medical School, and Doernbecher Memorial Hospital for Children; the Vocational Education Division; and the Rehabilitation Service for the Blind. The program would not function effectively without the splendid cooperation and assistance of the public health nurses. The understanding attitude and help of the staff of Oregon State School for the Blind have been of the greatest value to the success of the program. Children are transferred from the residential school for the blind (and partially sighted) to the public schools as soon as they have the training that enables them to make this adjustment. Partially sighted children who are unable to succeed in public school, even with the help the Division of Education can give, are admitted for an adjustment period to the State School for the Blind where every attempt is made to solve their problems, physical, educational, social, or psychological, with a view of returning at the earliest moment to the public school.[1, 2]

This program is still young; it has been in operation two and one-half years. It has many weaknesses and imperfections but the fundamental purpose has been, and will continue to be, to build a program that will conserve sight and help children with vision problems to make the best possible adjustment to their limitations. The aims of the joint efforts of the Division of Special Education and Oregon State School for the Blind have been expressed by Walter R. Dry, Superintendent of Oregon State School for the Blind:

> "No Oregon child shall be allowed to go through life with less sight than it is possible for medical science to give him.
>
> "No Oregon child shall be left with less education than he desires or is capable of getting because of a visual handicap.
>
> "No Oregon child with a visual handicap shall be required or permitted to jeopardize his sight or lessen his chances of becoming a well-integrated individual by reason of his doing or attempting to do public school work unaided."

[1] Fortner, Ethel Nestell. "Oregon State Supervisory Program for the Visually Handicapped," *Outlook for the Blind*, Vol. 39, No. 1: January, 1945.

[2] Lowenfeld, Berthold: "The Oregon Plan," *Outlook for the Blind*, Vol. 40, No. 3: March, 1946.

Industrial First Aid in Chemical Injuries of the Eye*

Augustus Gibson, M. D., and James M. Carlisle, M. D.

DISCUSSES definitive treatment for acid burns, alkali burns, superficial foreign bodies in the eye, as well as the subject of chemotherapy.

MAY we introduce this paper by a statement which we feel represents the consensus of those full time industrial physicians in the large industrial plants, where there are well planned and operating medical departments:

> Of all the commonly occurring injuries seen in industrial practice, those to the eye carry the most serious potentialities for permanent, serious disability. Proper early treatment, however, can usually greatly minimize or prevent such a result. It must be re-emphasized, therefore, that all but the most trivial of eye injuries should be promptly referred to an ophthalmologist if the welfare of the employee, the pocketbook of the employer, and the reputation of the industrial physician are to receive maximum protection.

There is a crying need in most small industries for "standing orders" that can be carried out by the nurse in industry. This need is accentuated by the really remarkable accomplishments of your Society. You have devoted much time and effort in getting across to the layman as well as the nurses and physicians in industry that in the event an irritant chemical has entered the eye, the first objective should be the immediate removal of the offending agent. This can best be accomplished by immediate irrigation of the eye with copious quantities of clean running water. The patient should

* This is a largely expanded article based on one under the same title appearing in Vol. XIII, No. 4, issue of the REVIEW. It is appearing as part of the *Proceedings of a Conference on Industrial Ophthalmology*, published by Columbia University Press.

then be sent directly to the Plant Medical Department. If there is an irritant reaction or a burning sensation from the material, the patient's eyes should be flushed with water immediately at the site of the accident.

Traumatic injuries should not be touched at the site of the injury but the patient should be sent directly to the Plant Medical Department.

After the above first aid treatment at the scene of the accident, the following treatment should be carried out in the Plant Medical Department:

(1) Test reactions of the contents of the conjunctival sac by lightly touching indicator paper to the mucous membrane surfaces of the lower fornix. (Litmus paper is poor because a large pH shift is required before a color change from the blue to red or from red to blue occurs. Alkacid test paper or pHydrion paper is much better because definite and easily recognizable color changes take place with a pH shift as small as 0.2 of pH unit. Nitrazine paper is satisfactory for acid burns, but poor for strong alkali burns.)

(2) Local anesthetic should be placed in the eye.

(3) Thoroughly wash the eyebrows and tegument surrounding the eye in order to remove all residual chemical or foreign particulate matter which may be present. This may be done while the anesthetic is taking effect.

(4) Copious irrigation of the eye with saline or distilled water should be immediately instituted.

(5) Place two drops of a 2 per cent sodium fluorescein solution on the eye, allow a minute for staining of any denuded area, and then rinse with physiological saline.

(6) Examine the eye under a Hague cataract lamp, or a strong beam of light, with the aid of a magnifying lens. The use of the Hague cataract lamp following the instillation of fluorescein very frequently permits one to detect foreign bodies and corneal abrasions, lacerations and chemical burns which would otherwise be missed. The extent and depth of the injury may be much more easily determined by this method. This should be followed by slit-lamp examination.

(7) If there is still discomfort after the above procedure, local anesthetic may again be placed in the eye, then followed by irrigation.

Definitive Treatment for Acid Burns

(1) Cold lavage compresses, changed every 3 to 5 minutes for a period of 1 to 3 hours. Mild oxidizing-reducing solutions such as a saturated solution of sodium thiosulfate are recommended. While the duration of this irrigation will depend upon the cause, type, extent and severity of the injury, the irrigation should always be continued until there is a maintained neutral reaction upon testing the secretions in the fornices.

Note.—Most acid burns of the eye are instantaneous and not progressive, and consist essentially in the precipitation and denaturing of the tissue proteins. The severity of the burn seems to depend upon the concentration of the acid and the degree of dissociation, the character of the anion, and, most important, the time that the acid remains in the eye before it is diluted and removed. As a general rule, acid burns heal more rapidly and are much less difficult to handle than alkali burns.

(2) Local anesthetics generally used are pontocaine, butyn, holocaine. Most uncomplicated cases of acid burns require a local anesthetic, an oily lubricant, and some non-irritating bacteriostatic substance, such as penicillin or streptomycin in the cul-de-sac during the first 24 hours. In every burn of the eye a symblepharon may develop if two denuded mucous membrane surfaces are approximated and immobilized. Liberal quantities of such ointments, together with twice daily compulsory inspections, will prevent many a symblepharon.

(3) Dark glasses, atropine, eye pads—the advantages to be derived from any or all of these, when needed, should not be overlooked.

As a general rule, acid burns are not progressive and secondary treatment is largely symptomatic. Additional measures include the use of the following:

a. Penicillin ophthalmic ointment, together with an eye pad, or the instillation of sterile castor oil, cod liver oil or olive oil. (These will alleviate the symptoms which usually accompany acid burns, as well as promote regeneration of the corneal epithelium.)

b. Removal of any discharge from the fornices by instillation of a mild silver protein 10 per cent solution followed by copious irrigations of boric acid.

c. Butyn and metaphen ointment. (Rapid but short-acting local anesthetic.)

d. Metycaine and merthiolate (slower than butyn but more prolonged action).

e. Holocaine (phenacaine) 1 per cent may be used. (Cocaine should not be used in view of the fact that it delays healing, softens and swells the cells, and produces further damage to the epithelium.)

f. Secondary infections are best treated with penicillin or streptomycin solutions, ointments, or the dry powders suspended in mineral oil.

Definitive Treatment for Alkali Burns

(1) Cold lavage compresses, changed every 3 to 5 minutes for a period of 1 to 3 hours. Mild oxidizing-reducing solutions are recommended. While the duration of this irrigation will depend upon the cause, type, extent, and severity of the injury, the irrigation should always be continued until there is a maintained neutral reaction upon testing the secretions in the fornices.

Note.—Since alkali burns, unlike acid burns, are nearly always progressive, there is a great deal that the first aid as well as definitive treatment has to offer, and especially does this apply to the benefits that will accrue from the continued irrigations with a mild buffer solution. In almost all cases it is advisable to keep these irrigations up for one-half hour or more.

(2) Cold compresses together with penicillin or streptomycin are useful in inflammatory affections of the conjunctiva. Edema of the lids and chemosis, so frequently seen in these burns, may be measurably reduced by a small cotton ball saturated with buffer solution, covered with a 4 x 4 inch gauze compress moistened in the cold buffer solution placed over the lids, or by the dry method (ice-bag), which, as a rule, is less painful to the patient if the skin of the face and forehead is protected. Ice should never be applied to the lids directly.

Note.—Since strong alkali solutions penetrate deeply into the cornea within a very few seconds, a resultant corneal ulcer may be anticipated by the swollen corneal stroma with leukocytic infiltration. Frequently the cornea temporarily becomes less cloudy, but on the fourth to eighth day a pannus of blood vessels enters the

cornea from the limbus, over which the corneal epithelium does not regenerate. In the event the cornea or conjunctiva is severely burned and appears white or gray, a symblepharon or corneal lesions, including adhesions between the lid and the eyeball, may develop.

(3) Dark glasses, atropine, eye pads should be used as required.

Additional routine measures in the treatment of alkali burns of the eye should include:

a. Instillation of atropine sulfate—1 per cent ophthalmic ointment or solution (the solution when irrigation, the ointment when oil is used).

b. Careful twice-daily inspection for adhesions between the lids and the globe. (A glass rod—cocktail stirrer—is very useful in breaking these adhesions.)

c. Liberal quantities of boric acid ointment placed between the globe and lid to act as a barrier and serve in prevention of further adhesions.

d. Any discharge removed from the cul-de-sac by the instillation of a mild silver protein 10 per cent solution, followed by copious irrigations of boric acid.

e. Penicillin and streptomycin ointments are very useful agents in preventing secondary infections.

Definitive Treatment for Superficial Foreign Bodies in the Eye

It is of the utmost importance that the patient be placed in a satisfactory position which will allow for perfect comfort and relaxation on the part of the patient as well as on the part of the physician.

These objectives can best be accomplished by the following:

(1) Place patient in reclining position.

(2) Administer local anesthetic, butyn, or pontocaine.

(3) The physician should sit at the patient's head. His elbows should rest on the cot, with his hands and face in such a position that he is looking and working from above downwards over the globe of the patient's eye.

Note.—There is much less danger of causing damage to the eye in this position than in having the patient sitting in a chair and the

operator working from a sitting position in front of the patient. Working from in front, a slip of the physician's instrument is almost certain to result in puncturing or otherwise severely damaging the patient's eye—working from above, a slip is likely to give only a tangential injury of much lesser severity.

(4) No patient should be allowed to leave the dispensary after a foreign body has been removed from the cornea or conjunctiva without first placing onto the bulb a couple of drops of 2 per cent sodium fluorescein solution or aqueous mercurochrome. Frequently in cases where there is a history of a foreign body but no foreign body is found, fluorescein instillations will reveal scratched surfaces of the cornea which are missed without the staining aid. I have found the Hague cataract lamp to be of great assistance since it furnishes a source of ultra violet light which may be used together with fluorescein to produce maximum visualization of the fluorescent phenomenon on the stained cornea.

Chemotherapy

Infection is occasionally a serious complication of chemical burns of the eye. Local chemotherapy, however, has eliminated many of its dangers. The sulfonamide drugs, although perhaps effective, are themselves so irritating in many cases that their routine local use cannot be advised. The antibiotics, however, do not have this disadvantage and are even more effective.

Penicillin has been used locally in the treatment of contaminated and infected wounds with much success.

It should be emphasized that the more concentrated solutions of penicillin may be irritating, especially to such sensitive tissues as the mucous membranes of the eye and nose. This effect should be watched for closely in all local applications of the drug. In an occasional case a contact dermatitis may develop but this is rarely of such severity as to preclude the use of penicillin in a severe infection with a susceptible organism, namely, the gram-positive organisms and Neisseria.

The published reports of Dr. L. von Sallmann indicate that therapeutic concentrations of penicillin may be obtained in the aqueous of rabbits by iontophoresis, using a sodium penicillin solution containing 5,000 Oxford units per cc. The penetration is

appreciably greater than that obtained by using baths, ointments or penicillin packs containing an equivalent concentration. However, we are informed by Dr. von Sallmann that by the use of cotton packs saturated with 0.1 cc. of sodium penicillin solution containing 20,000 Oxford units per cc. applied directly to the anesthetized eye of the rabbit, a higher concentration may be obtained than by the iontophoresis of a solution of 5,000 Oxford units per cc. The addition of various wetting agents or the use of other vehicles than normal saline does not appear to offer any advantage. Apparently the highest concentration which may be used by the method of iontophoresis without producing undesirable irritation is 5,000 or 10,000 Oxford units per cc., whereas by the cotton pack method there is apparently no objection to using 20,000 Oxford units per cc. However, in man the use of cotton packs has not produced as high or consistent concentrations of penicillin in the aqueous humor as it did in rabbits, so that it may, therefore, not be possible to transfer the results of these animal experiments directly to human therapy.

It appears that penicillin applied locally remains active for as long as 24 hours and from the standpoint of stability the dressings need not be changed at more frequent intervals except in the presence of excessive purulent discharge. When applied by iontophoresis or as a wet dressing, the loss in potency is negligible for one or two hours even though the temperature is as high as 45°C. (113° F.). Penicillin in dry form is irritating to mucous membranes and wound surfaces and, therefore, should not be used alone for topical application.

Irrigations are not recommended since the small amount of penicillin deposited on the globe and in the fornices remains there for such a short period of time that its effect is inappreciable. On the other hand, the moist packs must be kept continually wet in order to afford the proper time-dose relationship required for penicillin to exert its maximum effects. In many cases, particularly when continuous medical supervision is not possible, a petrolatum ointment may be most useful and has been found to give high concentrations in the affected tissues. This is prepared in a strength of 5,000 units per gram. Such an ointment is relatively stable if prepared under strict anhydrous conditions.

Streptomycin, which is effective against many gram-negative organisms, may also be applied locally. Experience with its local use in the eye is more limited than with penicillin. However, similar techniques may be used in cases in which bacteriological study indicates that the causative organism is streptomycin sensitive. In our cases we have used solutions or suspensions containing from 0.25 mg. to 0.5 mg. of streptomycin per cubic centimeter of menstrum or per gram of base.

Guarding Your Eyes*

Mrs. Eleanor Brown Merrill

WHAT everyone should know about eye care.

THE many letters that have been received following talks on eyes and their care leave no doubt as to your keen interest in the subject, and so I welcome the opportunity for another brief discussion this Saturday afternoon. One of the letters in particular gave us so much satisfaction and encouragement that I should like to read it to you. It was sent to a doctor who took time from his busy practice and hospital activities to talk about glaucoma—the eye disease which is responsible for many cases of blindness.

Here is the letter:

> "Dear Sir—I was packing my grip, preparatory to leaving for a job down in Miami. I had the radio on and heard you explain about rainbow halo which I had had on and off for two weeks. I went to 1790 Broadway, received circular information and advice to go to an eye clinic, which I did the Monday following. They found the condition of the right eye serious, and also left affected. Prompt treatment, exhaustive examinations—and here, ... after one month of careful treatment, the eyes are now normal, with the report to continue treatment and not return before another month.
>
> "Please accept my personal thanks and the knowledge that your broadcast undoubtedly saved my sight, for had I taken the trip, I no doubt would have neglected the condition until an operation might have been necessary to save some of the vision. I hope your message got home to many other listeners. Please advise me if you expect to lecture further on glaucoma.
>
> Respectfully,
>
> (signed)
>
> P.S. A million thanks."

* Radio talk over Station WMCA, under auspices of the New York Tuberculosis and Health Association and the Medical Information Bureau of the New York Academy of Medicine.

In guarding our eyes it is important not only to give them day-to-day care and consideration but to be on the alert for signs of trouble—which can often be headed off by seeking prompt treatment.

Happily, many people go through life with normal healthy vision, needing only the help of glasses when natural changes take place in the eyes at middle age. However, even if you are one of those so blessed with the most prized of possessions you should have a periodic examination by a competent eye physician. Certain eye diseases do not give obvious warning signs until they are well advanced, but the eye physician can detect them in the early stages and so prevent serious developments. If you are not able to afford the eye physician's office fee you can have an expert periodic examination and treatment, if necessary, at an eye clinic in one of the large hospitals.

One of the ways to keep eyes functioning efficiently is to maintain a healthy body. Lack of proper food, insufficient sleep, overwrought nerves, fatigue—all have definite effects on the eyes, a fact which is often overlooked. Delicate and sensitive as they are, normal eyes can take a lot of wear and tear and often do not show signs of abuse until it is too late to remedy the condition. By following the rules of good health we are actually conserving our vision.

Food which has been found to be particularly beneficial to the eyes includes carrots, dairy products, liver, and any other containing a good supply of vitamin A. The darker breads such as we have been asked to eat during the food shortage abroad are really richer in vitamins than the white variety, and so we can scarcely regard this measure as a sacrifice, but rather as a real contribution to health. A well-balanced diet, including all kinds of food is, of course, essential.

Let's give some consideration to the conditions in our homes that may have good or bad effects on the eyes. First, obviously, is the matter of lighting; for without light the eyes cannot function at all. You know that special schemes of illumination are necessary for factories, offices, and other places where work goes on continuously, but have you ever thought about the eye work that is done in the home and how it affects various members of the family? A certain amount of planning is advisable even for Dad's or Mother's reading

corner, and the places where young Betty and Bill do their homework.

A first principle is to have the light *well distributed*; that is, avoid bright spots and dark shadows. It's advisable to supplement the table lamps with light sources placed in the upper parts of the room, so that sharp contrasts will be eliminated and the light will be distributed more widely.

In planning lighting equipment it's well to remember that some of it will be looked *at*. That is, if you are sitting in your living room there may be several lamps within your view, and they may cause discomfort to your eyes if the shades are too transparent to diffuse the light or if the bulbs are unshaded. This applies particularly to lamps and fixtures in dining and bed rooms, as well as the living room. Avoid glare from any light source. Shade linings should be white, ivory or a very pale tint. Color on the inside of the shade simply absorbs light and wastes it. Open-top shades on lamps allow interesting high lights on walls and help to distribute light more evenly.

Lamps for sewing, writing or other handwork should be placed on the side opposite the hand used, so as to avoid a shadow of the hand on the work.

The use of color in relation to lighting is a fascinating study and one which we heartily recommend to anyone interested in planning an attractive, comfortable home. Certain colors—ivory, soft yellow, light green, for example—reflect light and improve seeing conditions. Dark browns and grays, on the other hand, absorb a great deal of light and are sombre and depressing. Advice on color schemes that are both pleasing and kind to the eyes is available from a number of sources. We shall be glad to give this information to anyone who is interested in having it.

Getting back to the eyes themselves—there are several things that I want to emphasize strongly, and they relate to the young people in the family. Children's eyes are best adapted to distant sight. At short range they can see details clearly for a brief time, but long periods of close work make them tired and irritable. This is because their eyes are normally far-sighted and not adapted to prolonged close work such as reading. The schools plan their programs so as to alternate periods of close work with activities in

which the children use their eyes at a distance, and so relax and rest them. Wise parents will follow this plan at home. Encourage inveterate young readers to put away their books after a reasonable period and find something active to do.

Some children are irritated by doing any kind of close work even for short periods. They rub their eyes, frown, complain of headaches, obviously are inattentive and uncomfortable. These are the signs to watch for—also any tendency to cross-eyes which may be apparent after the age of six months. Before that, the baby hasn't learned to make his eyes work together.

Such signs in children mean that a thorough examination by an eye physician is needed. In any case, it is wise to have such an examination made well before the child is ready for school. If the physician prescribes glasses give the youngster all possible encouragement in wearing them—don't joke about them or suggest in any way that they are unbecoming. Soon he will accept the glasses in the same spirit we older folks do when we find how much they add to our comfort and skill in doing things.

Children in school are examined regularly by the physician, nurse or teacher to discover any eye defects that may require care or indicate that assignment to a special sight-saving class is necessary. If any type of special eye care is recommended for your child it is your responsibility to see that he gets it. Often the child's progress in school is seriously retarded by faulty vision.

Illness weakens the eyes as well as the rest of the body, and the communicable diseases of childhood are responsible for many eye defects. When a child—or an adult for that matter—is getting over an illness, find diversions for him that do not involve close eye work, because under such conditions eyes need rest.

Supervise the child's playthings carefully—avoiding any that have sharp points and edges, also so-called "toy" firearms, and air rifles. All of these are hazardous in the hands of youngsters, who, when past babyhood, will see the reasons for choosing safer playthings if the dangers are explained to them. Another word of caution about the baby—don't let him lie in his carriage or crib facing the sun or any strong light. His eyes can be permanently injured in this way.

I should like to tell you something about glaucoma, the disease which causes more than a tenth of the blindness in the United States. It is particularly insidious because it may creep upon an unsuspecting victim with little warning and destroy his sight unless he recognizes the early symptoms. The eye physician looks for such symptoms every time he examines your eyes, even though you have not complained of them—and that's another good reason for visiting him periodically.

Certain types of glaucoma are indicated by redness of the eyes, severe pain and loss of sight. The more common type is very much slower in its course. It may be indicated by blurred vision, lasting for a short time and occurring in the evening, or after much worry or hard work. These attacks are often relieved by rest but come again with increasing frequency. Seeing colored rings or halos around lights may be another sign of glaucoma, although such symptoms accompany other eye diseases as well. The need for stronger reading glasses at frequent intervals is a warning that glaucoma may be threatening.

If unchecked, this disease ends in blindness, but it can be stopped in the vast majority of cases which are seen by the eye physician in the early stages.

Glaucoma and the other eye diseases which sometimes appear in middle age should not give undue cause for alarm. Excitement, nervousness, lack of control only aggravate unfavorable eye conditions and make improvement more difficult. By cheerfully cooperating with the eye physician and conscientiously following the course of treatment prescribed, the best results can be obtained.

Accidents in the home result in many cases of serious eye injury and sometimes in blindness, though their prevention is a simple matter. Objects falling from high places, spattering grease, careless use of sharp tools and kitchen utensils are some of the hazards that can easily be eliminated by good housekeeping and especially by constant supervision when there are small children in the family.

Every eye injury, no matter how slight it seems, should be taken seriously. Even a small speck or cinder may lead to infection and scar formation if not properly removed. If a foreign body in the eye is not easily washed out with a boric acid solution, or removed from the lower lid by using a small piece of sterile cotton, the

patient should be sent to a physician. This is especially true of specks imbedded on the front of the eyeball.

Other types of eye injuries require professional treatment. Even a trained first aider must recognize that care of such a delicate organ as the eye is beyond his limitations.

In short talks such as this, one can only touch on some of the knowledge that we all should have about how our eyes work, how to keep them functioning well, and how to guard them against infection, disease, and injury.

Note and Comment

Eye Institute in June.—Because of the pressing demand for trained personnel in various fields of prevention of blindness the National Society is planning an intensive course to be given at headquarters, 1790 Broadway, June 10 through 21. The lectures, covering medical, social, educational and historical aspects of sight conservation and prevention of blindness, will be presented by a number of outstanding ophthalmological and other professional representatives as well as members of the staff.

Educational Approach for Successful Goggle Program.—Eye accidents are the most predominant of all accidents occurring in shipyards, but Roy Perry, chief safety inspector, Electric Boat Company, Groton, Conn., found a way to reduce them, which resulted in a 65 per cent reduction in total eye accidents during 1944—at the height of activity in submarine construction. Each new employee is given a period of safety instruction, fitted with the proper goggles, and then introduced to the foreman of the department to which he has been assigned. These foremen have to "think goggles, talk goggles, wear goggles." They make this alertness part of their daily routine, and stop men whenever they observe them working near eye exposures without eye protection, and they make them put on goggles. Workers are given a choice of goggles, and have, set up for their use, a goggle fitting, sterilization, repair, and prescription service. In addition, ideas are developed and applied to keep the flow of information on eye protection constant and complete. Some of these ideas are:

1. Welder's screens were painted and lettered with eye slogans and spotted around the plant.
2. Eye slogan signs such as, "If You Had Worn Goggles, You Wouldn't Be Here," were tacked on the ceiling directly over the eye treatment chair in the yard hospital.
3. Special eye posters were drawn and silk-screened by a nationally known artist here in the plant.
4. News items featuring the reduction in eye accidents were released to the local daily newspaper.

5. Broken goggles were exhibited to show how goggles "paid off" and glass eyes displayed as a perfect match, but—sightless.
6. Facts and figures on eye safety were made a part of the daily program over the plant public address system.
7. Welding supervisors instructed welders when they had men holding or placing work for them, these men must wear goggles, and not to weld unless they did.
8. "Eye Repeaters," workers with two or more eye injuries in one month, were called to the attention of their supervisors.
9. Many of the supervisors were made to feel that they should set a good example and wear goggles. Eye accidents were analyzed at all monthly departmental safety meetings. Cost sheets, graphs, and eye literature were prepared and distributed to supervisors at these meetings.

Eliminating Eyestrain During Classroom Motion Pictures.—Seating and screen position are two problems which arise in fitting the classroom for sound motion pictures. The screen width, generally, should be one-sixth the length of the room and should be mounted so that the base is at or above the audience eye level. Eye fatigue can be decreased and more latitude for effective screen illumination can be provided usually by moving the audience back a few rows. Those sitting in front should not be closer than twice the screen width. In a quadrant, twenty-six degrees on either side of the projection axis, beaded screens provide satisfactory illumination; beyond these limits light drop-off is considerable. In short, wide rooms, a matte surface gives considerably adequate illumination through a wide angle.

Unusual Accidents and Practical Jokes.—An attempt to get a laugh may sometimes incapacitate a man for life; yet despite accident prevention efforts in industry "horseplay" continues to cause immeasurable tragedy as well as thousands of dollars expense. A recent issue of the *Ohio Industrial Commission Monitor* contains a number of illustrative stories, of which the following are significant:

A foreman in a Lima, Ohio, steel foundry, while teaching a laborer to weld, suggested that he rest awhile. A welder gave him a cigarette, which he and the foreman had stuffed with gun powder and match heads for a "joke." As they expected, the cigarette

exploded. The victim fell! Upon examination, the doctor found the patient had lost complete sight of his left eye and later the right became affected and its condition is growing worse.

In a Cleveland plant, some supervisors playfully inflated a 4-foot army balloon, which they bounced about. A nail caused a rip, which they patched with a paper sticker and then they re-inflated the balloon with acetylene gas and compressed air. It floated over a partition and exploded, causing injury to the ear-drums of two employees, and also lacerated an eye of one of the victims.

A 30-watt, germicidal ultra-violet lamp that was to be used to kill insects in the courthouse in Defiance was accidently turned on when it was left on the commissioner's desk, affecting the eyes of the County Commissioners who sat around the desk in a two-hour conference, some of them requiring hospitalization.

A Cleveland dentist was working on a grinding wheel when it broke, a fragment flying with such force that it smashed his glasses and destroyed the sight of one eye. As often happens, sympathetic ophthalmia developed and the patient is now facing blindness.

In Dayton, an employee working at a whirling drill was saved by wearing safety goggles—they deflected the path of a jagged piece of the drill-point which flew, with the speed of a bullet, directly for his eye. The glasses were damaged but his eye was saved.

Poor Light Develops Faulty Posture.—At a recent meeting of the Illuminating Engineering Society in Chicago, Dr. Darrell B. Harmon of the Texas State Department of Health stressed the value of good schoolroom lighting to produce good posture habits. With bad light, the children duck their heads and twist their bodies to avoid glare, and grow up with these faults a part of their physical make-up.

Book Reviews

THE PSYCHOLOGY OF SEEING. Herman F. Brandt, Ph.D. New York: Philosophical Library, 1945. 240 p. Ill.

If we accept the study of human behavior as a means of understanding the human mind, it would seem logical to narrow the investigation to the behavior of the eyes as a means of understanding the mental process of seeing. The objection arises, however, that this is dangerously near a *reductio ad absurdum;* it seems to ascribe too much to the outward motor evidence of a complicated mental process. But the author has taken this and other objections into consideration, and he develops his thesis logically. He believes that the eyes (and eye movements) are primarily servants of the mind, but he also believes that there is a causal relationship, both afferent and efferent, between the mental processes and the eye movements. And thus, if reading disabilities can be evaluated by this external evidence, remedial measures can be instituted.

Ocular photography has been used as a means of showing eye-movement habits. The experiments have been well controlled. The results are not startlingly new, but they do serve to demonstrate certain fundamental motor habits in their relation to external influences such as color, size, shape, position, etc. The underlying causes for a given type of behavior are not thoroughly understood, but it is felt that analysis and research will eventually give the answer.

The factual studies of eye movements show the apparently erratic excursions of normal eyes in such different tasks as solving geometrical problems, studying texts, casually reading advertising layouts and viewing pictures. The eye pattern differs, of course, in different individuals and this is analyzed and interpreted in relation to the subject's I.Q., or interest in the subject matter, or special training, etc.

The reader may not agree with the author's postulates that it will be possible to:

Measure intellectual abilities,

Ascertain aptitudes,
Evaluate inadequacies,
Determine the effect of fatigue,
Judge the degree of intoxication,
Detect guilt or innocence of a criminal,
Identify personal traits and characteristics.

The book is clean-cut and well illustrated. There are 220 pages of text, followed by a bibliography, a glossary, and a good index. It makes interesting reading.

—WILLIS S. KNIGHTON, M.D.

Briefer Comment

OPTICAL INSTRUMENTS. Earle B. Brown. New York: Chemical Publishing Co., Inc., 1945. 567 p. ill.

Because of the technical nature of the book, it will interest, primarily, those who are somewhat familiar with optics, as the beginner is likely to find the theoretical treatment of this subject ponderous. The author covers the entire field of optical instruments, and includes manufacture and design as well as the care and maintenance of optical instruments, with special emphasis on the telescope and spectroscope. The glossary of technical terms and the illustrations by the author are helpful and instructive.

THE DISABLED VETERAN. The Annals of the American Academy of Political and Social Science. Philadelphia: The American Academy of Political and Social Science, Vol. 239, May, 1945. 230 p.

It is to be regretted that little or no space is given to a discussion of veterans who have become handicapped through disabling injury to the eyes themselves; nor to the subject of the injured veterans who are further handicapped by visual difficulties.

Contributors to This Issue

Arnold Sorsby, M.D., one of England's outstanding ophthalmologists, is the author of many articles and books on the various aspects of sight conservation.

Harry Wain, M.D., is Commissioner, Department of Health, Miami County and Troy, Ohio.

Joseph Lo Presti, M.D., formerly of the U. S. Public Health Service, is now a practicing ophthalmologist in Boston, Massachusetts.

Ethel Nestell Fortner is Supervisor of Education of the Visually Handicapped, State Department of Education, Division of Special Education, Salem, Oregon.

Augustus Gibson, M.D., and **James M. Carlisle, M.D.,** are members of the medical staff of Merck & Company, Inc.

Mrs. Eleanor Brown Merrill needs no introduction as Executive Director of the National Society for the Prevention of Blindness.

Our book reviewer, **Willis S. Knighton, M.D.,** practicing ophthalmologist in New York, is chairman of the Society's committee on glaucoma.

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